DEMAND FOR HEALTH CAPITAL

EE 474 Health Economics

Semester 2/2021

Topics

- The Demand for Health
- Labor–Leisure Trade-Offs → U-max model
- The Investment/Consumption Aspects of Health
- Investment over Time
- The Demand for Health Capital *
- Changes in Equilibrium: Age, Wage, and Education

The Demand for Health

- It is not medical care as such that consumers want, but rather health.
  - People demand medical care inputs to produce health.
- Consumers *cannot* simply purchase health from the market.
  - Instead, consumers are *health producers* (by using their own health-improving efforts in combination with purchased medical inputs).
- Health can be thought of as a *capital good*; it lasts for more than one period and depreciates over time.

The Demand for Health

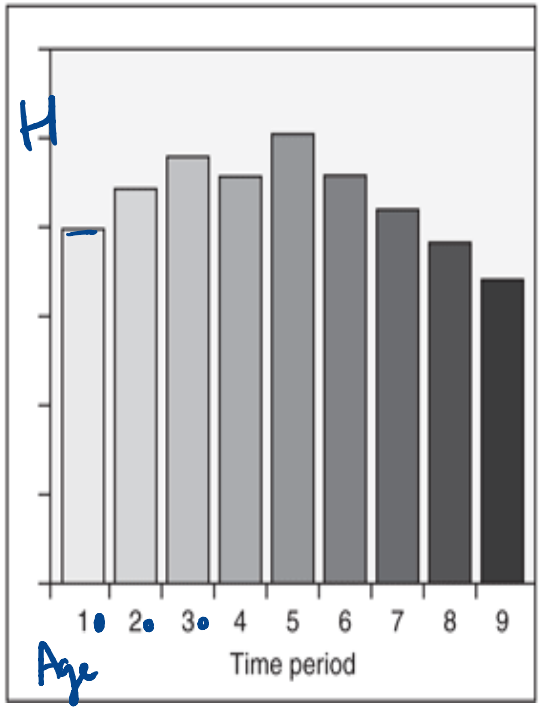
- Health can be treated both as a *consumption good* and an *investment good*.
- As a consumption good, health is desired because:
  - It makes people *feel better*;
  - It makes people *live longer*.
- As an investment good, health is desired because:
  - It *increases the number of healthy days* available to work and to earn income;
  - It *increases the productivity* when working and increase the earning for each working hour.

A Schematic

Health inputs

Health care
Diet
Exercise
Environment
Income
Time

Health capital stock over time



Health outputs each year

Healthy days:
Physical health
Mental health
Activity limitation

A Model for Time Spent Producing Health

2 Goods : health and other goods (Bread: B)

- Production of health (*I = investment in health*):

$$I = I(M, T_H)$$

where M = medical care, T_H = time used in producing health

- Production of other goods:

$$B = B(X, T_B)$$

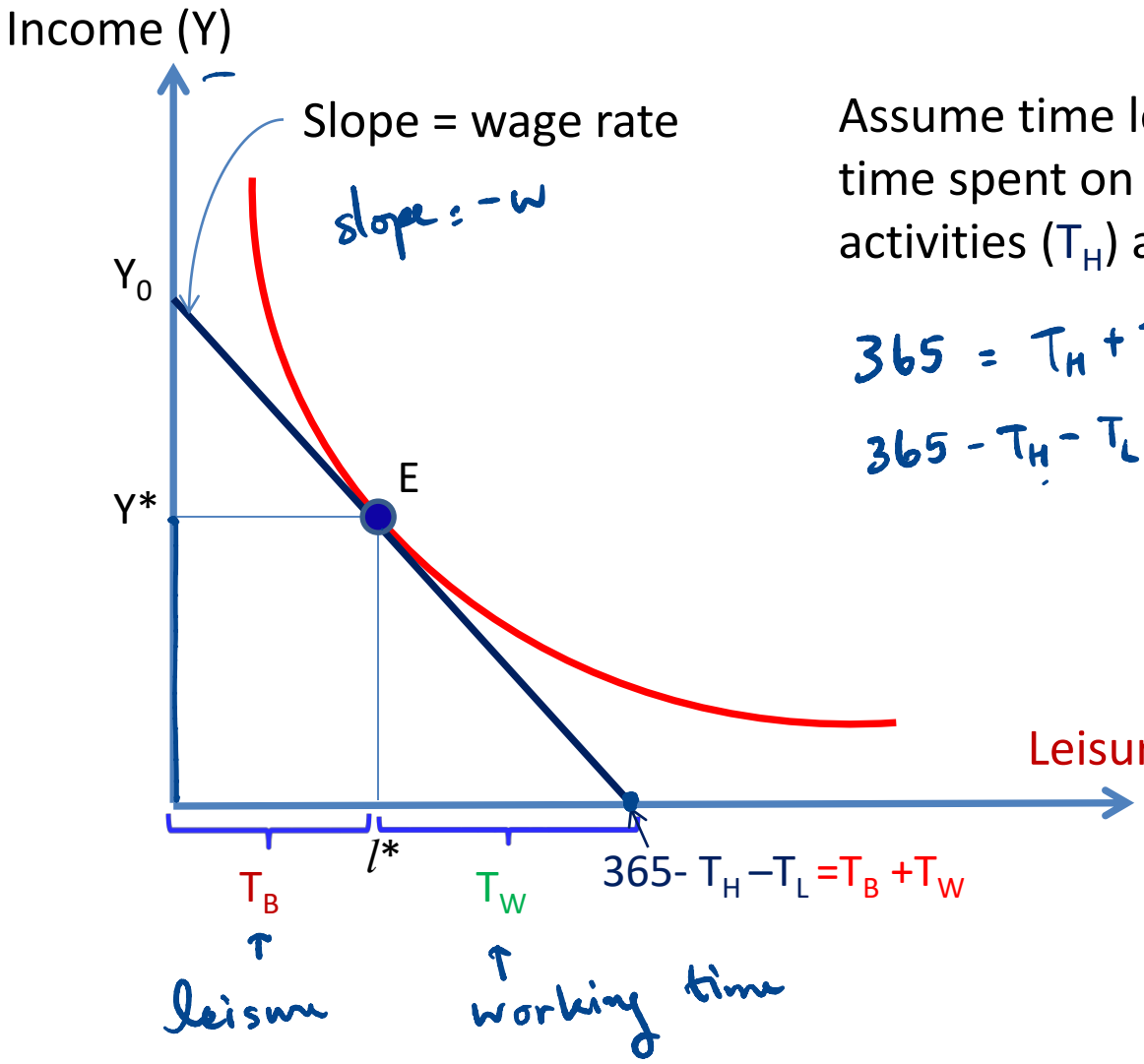
where X = purchased goods, T_B = time used producing other goods

- Total available time: Time constraint

$$T = 365 = T_H + T_B + T_L + T_W$$

where T_H = improving health, T_B = producing other goods, T_L = lost to illness, and T_W = working

Labor-Leisure Trade-offs



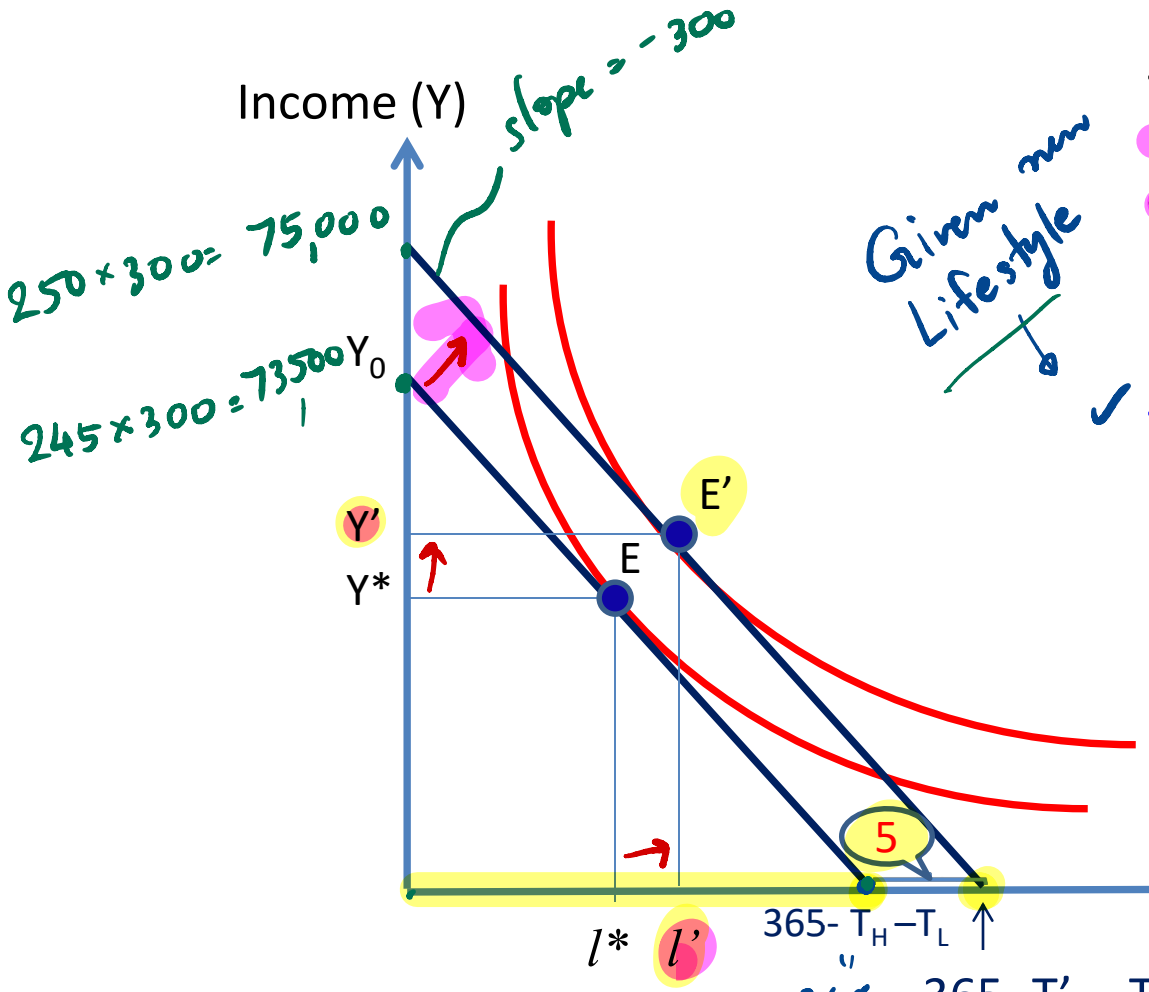
Assume time lost (T_L) and time spent on healthy activities (T_H) are fixed.

$$365 = T_H + T_L + T_B + T_W$$

$$365 - T_H - T_L = T_B + T_W$$

Labor-leisure trade-off

Impact of Investments in Health



Given new Lifestyle

Suppose that time spent on health investment results in a *net gain* in available time.

Ex: Let $T_H = 100$ and $T_L = 20$

→ $T_B + T_W = 365-120 = 245$

✓ Suppose $T'_H = 110$ and $T'_L = 5$

→ $T'_B + T'_W = 365-115 = 250$

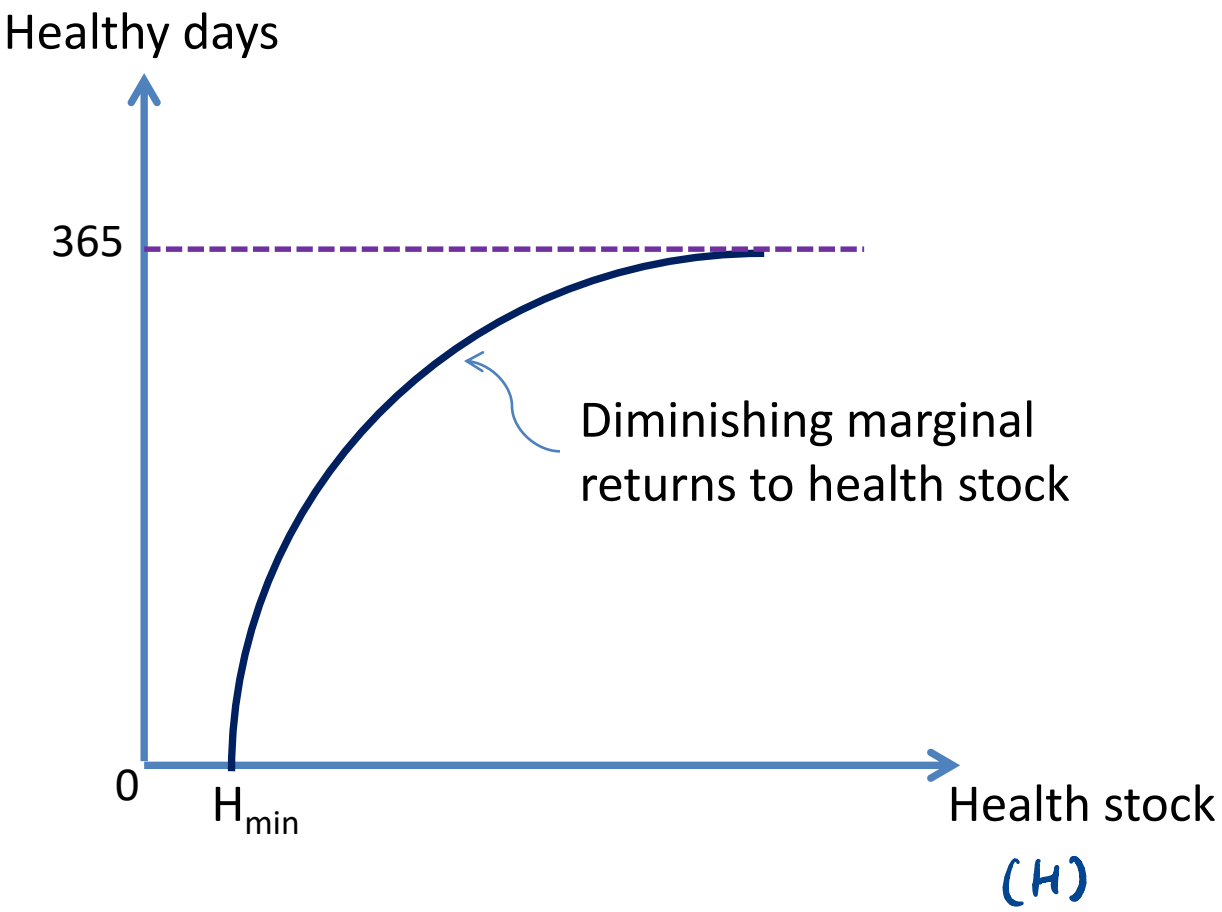
everything else constant.

Suppose $w = \$300/day$

Max income = ?

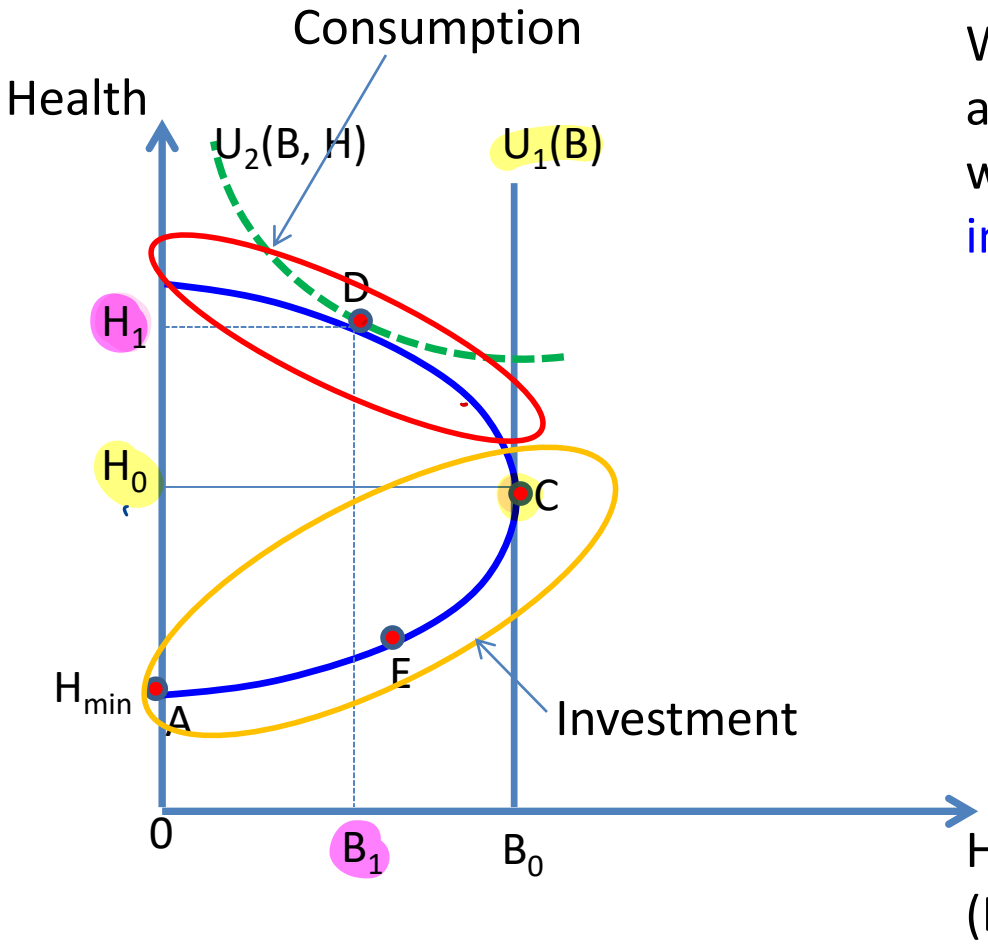
↑ max days you can work.

Production of Healthy Days



Investment/Consumption Aspects of Health:

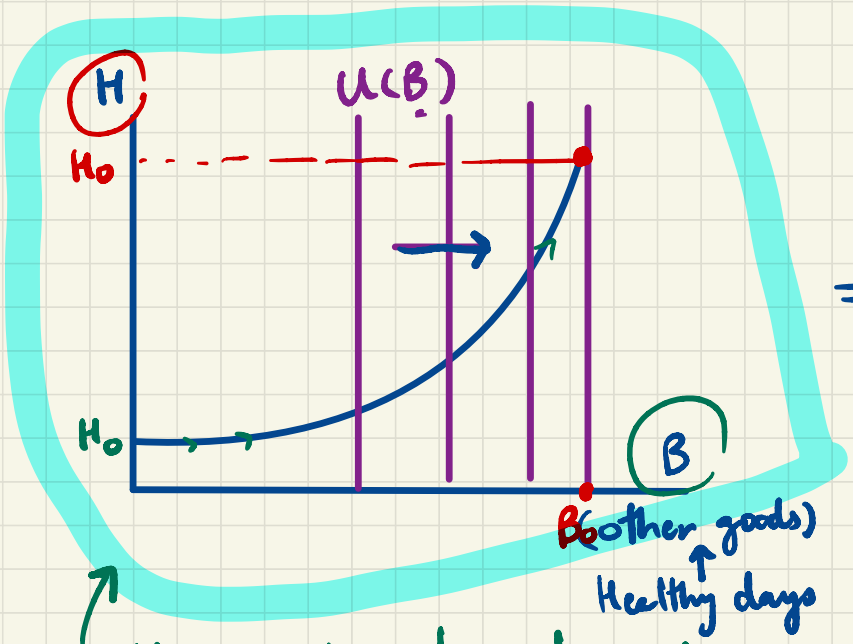
Production of Home and Health Goods

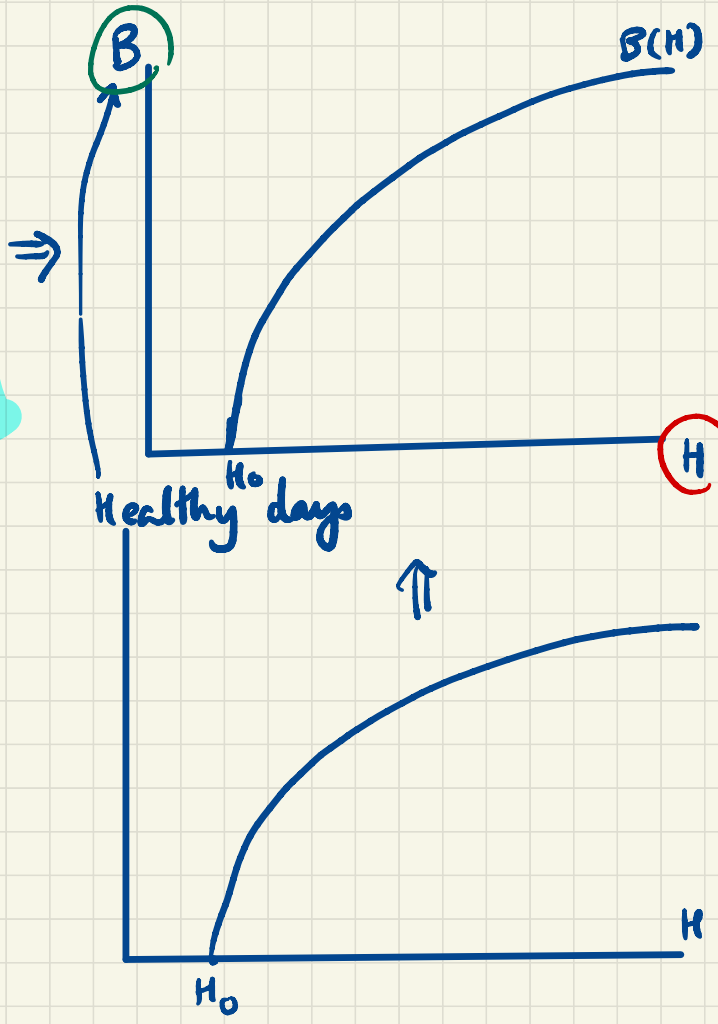


Which part illustrates health as a consumption good, and which illustrates health as an investment good?

Pure investment model
→ (B_0, H_0) is optimal.

Consumption-investment model
→ (B_1, H_1) is optimal.





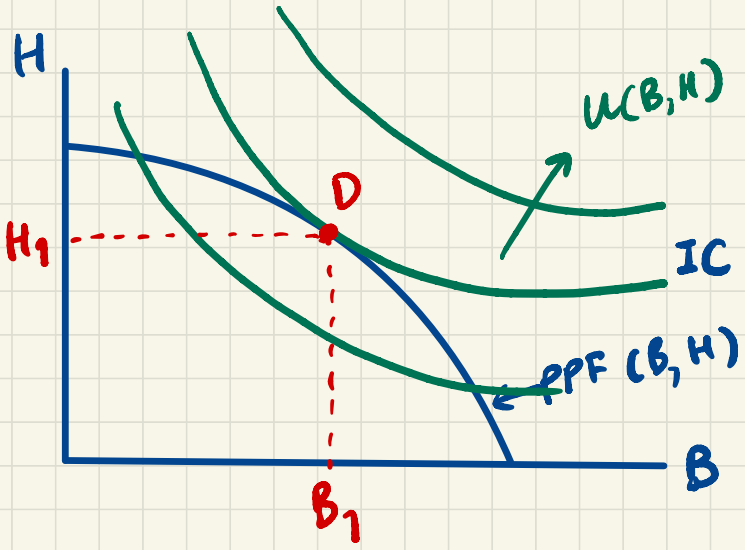
Health as investment goods

↳ It doesn't enter utility funct^{n}.

$\max_{H,B} U(B)$ s.t. $B = B(H)$

$\Rightarrow$ Optimum is (B_0, H_0)

Health as consumption

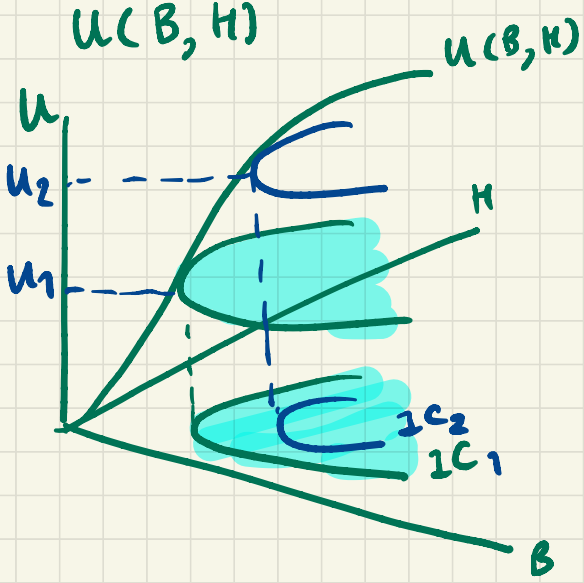


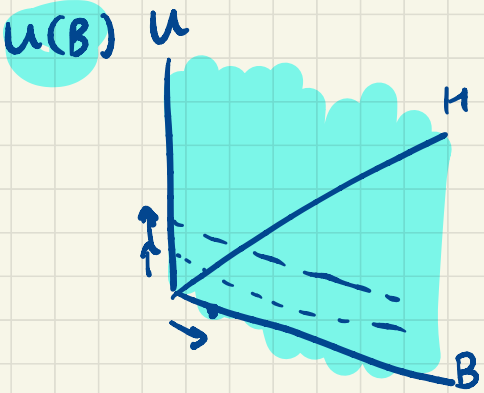
$\Rightarrow$ Max $U(B,H)$

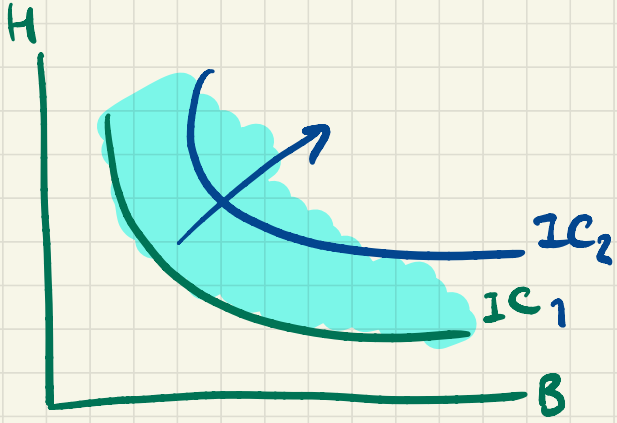
s.t. PPF (B,H).

$\Rightarrow$ Optimum is (B_1, H_1)

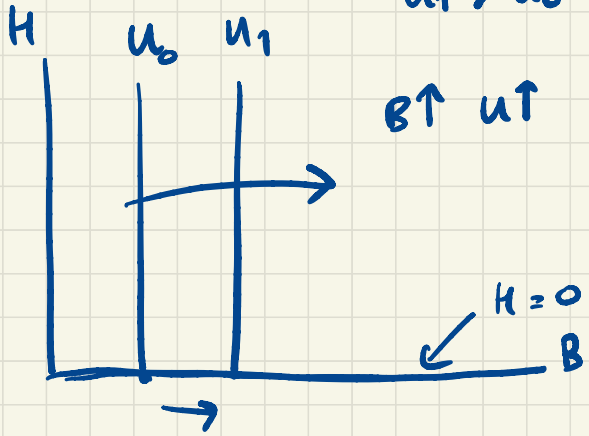
Indifference Curve







$U_1 > U_0$



Investment in Health Over Time

- Think of health as a *capital*. So what does it *cost* to invest in health capital?
- Use an analogy of an investment in an X-ray machine:
  - Costs
  - Future earnings → expected returns
  - Depreciation
- Example: Suppose an X-ray machine costs $100,000, and the interest rate is 5% per year.
  - How much revenue should we receive from the use of this X-ray machine to make it a good investment?

Cost of Capital

"opportunity cost"

- The *cost* of an X-ray machine = $100,000.
  - Suppose the machine wears out to half of its value within five years. At year 5, value = 50,000
    - The *total* depreciation cost = $50,000 (i.e. $10000/year)
  - Alternative: Invest in a saving account (r=5%)
    - Year 1: 100,000 * 1.05 = 105,000
    - Year 2: 105,000 * 1.05 = 110,250
    - Year 3: 110,250 * 1.05 = 115,763
    - Year 4: 115,763 * 1.05 = 121,551
    - Year 5: 121,551 * 1.05 = 127,628
    - *Total* Incremental Revenue = **27,628** = 127,628 - 100,000
  - Need the total revenue = 27,628+50,000 = 77,628

opportunity cost

depreciation rate = 10,000 / 100,000 = 10% (per year)

Q: If the x-ray machine yields revenue of $15,000/year, should invest?

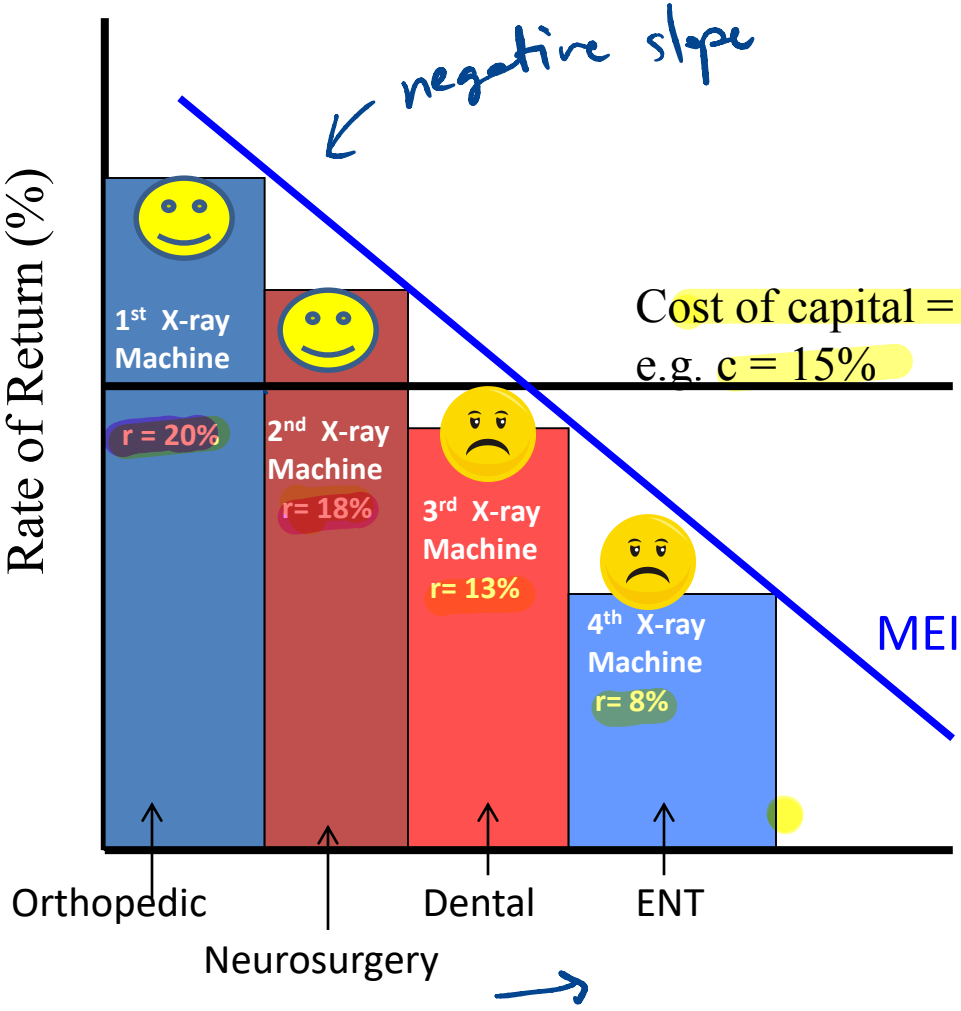
Demand for Health Capital

r + δ = 15 % (constant)

5 %. 10 %.

- Supply Side (r + δ)
  - Cost of capital = Forgone interest rate (r) + Depreciation rate (δ)
- Demand Side
  - Rate of return on investment (γ) γ = gamma
    - Example: Suppose the return from the X-ray machine is $20,000 each year.
      - The annual *rate of return* = 20,000 ÷ 100,000 = **20%**
  - Marginal Efficiency of Investment (MEI): Describes the pattern of rates of return (γ).
    - *Rate of return declines* as the amount of investment increases.
- ***Optimal demand for health*** *occurs at the intersection of the MEI curve and the cost of capital curve.*

Marginal Efficiency of Investment (MEI) and Rate of Return



Cost of capital = interest rate + depreciation rate
e.g. c = 15%

is downward sloping b/c of diminishing return to investment.